1. ANATOMY: THE THREE TUNICS (COATS)

The eye is organized into three distinct layers:

- **Outer Fibrous Layer:** Includes the **Sclera** (posterior 5/6) and the **Cornea** (anterior 1/6).
- **Middle Vascular Layer (Uvea):**
  - **Iris:** Regulates light via the pupil.
  - **Ciliary Body:** Produces **Aqueous Humor** and controls lens shape (accommodation).
  - **Choroid:** Provides blood supply to the outer retina.
- **Inner Neural Layer:** The **Retina**, containing photoreceptors.

2. SEGMENTS & CHAMBERS

- **Anterior Segment:** Everything in front of the lens. It is divided into:
  - **Anterior Chamber:** Between the cornea and the iris.
  - **Posterior Chamber:** Between the iris and the lens.
- **Posterior Segment:** Everything behind the lens (contains Vitreous Humor).

3. PHOTORECEPTORS: RODS VS. CONES

- **Rod Cells:** Responsible for **scotopic vision** (night vision) and peripheral vision. They contain **Rhodopsin**. High concentration in the peripheral retina.
- **Cone Cells:** Responsible for **photopic vision** (daylight), color vision, and high visual acuity. Concentrated in the **Fovea Centralis** (Macula).

1. EYELID PATHOLOGIES

- **Hordeolum (Stye):**
  - **INV:** Clinical diagnosis based on localized painful swelling.
  - **TX: Warm compresses** (10-15 mins, 4x daily) to drain the gland. Topical antibiotics if recurring.
- **Chalazion:**
  - **INV:** Clinical (painless, firm nodule). If it recurs in the same spot in an older patient, biopsy to rule out **Sebaceous Cell Carcinoma**.
  - **TX:** Warm compresses; if it persists >1-2 months, **Incision and Curettage (I&C)** or intralesional steroid injection.
- **Entropion & Ectropion:**
  - **INV:** Slit-lamp exam to check for corneal abrasions (in entropion) or dryness (in ectropion).
  - **TX: Surgical correction** of the eyelid position is the definitive treatment.

2. CATARACT (LENS OPACITY)

- **Senile Cataract:**
  - **INV: Slit-lamp biomicroscopy** (to grade opacity) and **A-scan Biometry** (to calculate the power of the Intraocular Lens - IOL).
  - **TX: Phacoemulsification** with IOL implantation is the modern standard of care.
- **Congenital Cataract:**
  - **INV:** Check for "Red Reflex" (it will be absent or white - **Leukocoria**).
  - **TX:** Early surgery (within weeks) to prevent **Amblyopia**.

3. VASCULAR OCCLUSIONS (OCULAR EMERGENCIES)

- **Central Retinal Artery Occlusion (CRAO):**
  - **INV:** Fundoscopy (Cherry-red spot); **Fluorescein Angiography (FFA)** shows delayed arterial filling.
  - **TX: Ocular Emergency.** Digital massage, anterior chamber paracentesis (to drop pressure), and carbogen inhalation to dislodge the embolus.
- **Central Retinal Vein Occlusion (CRVO):**
  - **INV:** Fundoscopy (Blood and thunder); **Optical Coherence Tomography (OCT)** to check for macular edema.
  - **TX:** Intravitreal **Anti-VEGF injections** (e.g., Ranibizumab) or laser photocoagulation if neovascularization occurs.

4. RETINAL DETACHMENT (RD)

- **INV: Fundoscopy** (shows a gray, elevated "billowing" retina); **B-scan Ultrasound** if the view is blocked by hemorrhage.
- **TX:** Surgical emergency. Techniques include **Scleral buckling**, **Pneumatic retinopexy**, or **Pars Plana Vitrectomy**.

5. REFRACTIVE ERRORS

- **Myopia/Hypermetropia/Astigmatism:**
  - **INV: Snellen Chart** for visual acuity; **Retinoscopy** or automated refraction for the prescription.
  - **TX:** Corrective lenses (glasses/contacts) or refractive surgery like **LASIK**.
- **Presbyopia:**
  - **TX: Reading glasses** (convex lenses) for near work.

6. DACROCYSTITIS (LACRIMAL INFECTION)

- **INV: Regurgitation test** (pressing the sac results in pus/mucus from the puncta).
- **TX (Acute):** Systemic antibiotics (Co-amoxiclav) and warm compresses.
- **TX (Chronic/Definitive): Dacryocystorhinostomy (DCR)** surgery to create a new drainage path.

7. SQUINT (STRABISMUS)

- **INV: Cover-Uncover Test** and **Hirschberg Test** (corneal light reflex).
- **TX:** Correct refractive errors first; **Patching** the "good" eye to treat amblyopia; surgery on extraocular muscles if needed.

8. ANATOMY & PHYSIOLOGY

- **Aqueous Humor Flow:** Produced by Ciliary Body → Posterior Chamber → Pupil → Anterior Chamber → **Trabecular Meshwork** → Canal of Schlemm. *
- **Visual Pathway:** Retina → Optic Nerve → **Optic Chiasm** (decussation) → Optic Tract → Lateral Geniculate Nucleus → Occipital Cortex.
    - **NRE Trigger:** Bitemporal hemianopsia = Pituitary tumor pressing on the Optic Chiasm.

9.NERVE INNERVATION

- **CN II (Optic):** Vision (Sensory).
- **CN III (Oculomotor):** Most extraocular muscles, levator palpebrae (lifts lid), and pupillary constriction.
- **CN IV (Trochlear):** Superior Oblique muscle (Mnemonic: **SO4**).
- **CN VI (Abducens):** Lateral Rectus muscle (Mnemonic: **LR6**).
- **CN VII (Facial):** Closes the eyelid (Orbicularis oculi).

1. ANATOMY OF THE EAR & HEARING LOSS

- **External Ear:** The canal is **"S-shaped"** (outer 1/3 is cartilaginous with hair/glands; inner 2/3 is bony/skin-only).
- **Middle Ear:** A six-sided box. The **Facial Nerve** runs through the medial and posterior walls. The **Eustachian Tube** connects it to the nasopharynx (shorter and more horizontal in children, which is why they get more infections).
- **Hearing Loss Scenarios:**
    - **Conductive (CHL):** Rinne Negative (Bone > Air). Weber lateralizes to the **diseased** ear.
    - **Sensorineural (SNHL):** Rinne Positive (Air > Bone). Weber lateralizes to the **better** ear.
    - **Presbycusis:** Most common SNHL; bilateral, high-frequency loss in the elderly.
    - **Noise-Induced:** Characterized by a **"notch" at 4000 Hz** on Pure Tone Audiometry (PTA).

2. DISEASES OF THE EXTERNAL EAR

- **Hematoma of Auricle:**
    - **INV:** Clinical.
    - **TX:** Must perform **Incision and Drainage (I&D)** and use a "bolster" or pressure dressing. If left alone, blood cuts off nutrition to the cartilage, leading to **Cauliflower Ear**.
- **Otitis Externa (Bacterial vs. Fungal):**
    - **Bacterial:** Diffuse edema and extreme pain on tragal pressure. TX: Antibiotic drops (Ciprofloxacin).
    - **Otomycosis (Fungal):** Itching is the main symptom. Look for **"Wet blotting paper"** (Aspergillus niger - black dots) or **"Cotton wool"** (Candida - white). TX: Clotrimazole drops and ear toilet (cleaning).
- **Malignant Otitis Externa:** Not a cancer, but a life-threatening infection (Pseudomonas) in **Diabetics**.
    - **Sign:** Granulation tissue at the bony-cartilaginous junction.
    - **TX:** Long-term IV Ciprofloxacin.

3. MIDDLE EAR: ASOM, CSOM, & CHOLESTEATOMA

- **Acute Suppurative Otitis Media (ASOM):**
    - **Stages:**
        1. **Tubal Occlusion:** TM retracted.
        2. **Pre-suppuration:** Cartwheel appearance of TM (vessels radiate).
        3. **Suppuration:** TM bulges (Light reflex lost).
        4. **Resolution/Perforation.**

    - **TX:** Amoxicillin-Clavulanate. If TM is bulging and pain is severe: **Myringotomy** in the postero-inferior quadrant.
- **Chronic Suppurative Otitis Media (CSOM):**
    - **Tubotympanic (Safe):** Central perforation. Discharge is mucoid and non-foul smelling. TX: Aural toilet, antibiotic drops, and **Myringoplasty** (repair of TM).
    - **Atticoantral (Unsafe):** Attic or marginal perforation. Foul-smelling, scanty discharge.
    - **Cholesteatoma:** "Skin in the wrong place." It acts like a tumor, secreting enzymes that erode bone (ossicles, mastoid, facial nerve canal).
    - **INV:** HRCT Temporal Bone.
    - **TX:** Always surgical (**Modified Radical Mastoidectomy**).

4. INNER EAR & VERTIGO

- **Meniere's Disease (Endolymphatic Hydrops):**
    - **Patho:** Excessive pressure of endolymph.
    - **INV: Glycerol Test** (improvement in hearing after drinking glycerol). PTA shows **low-frequency SNHL**.
    - **TX:** Acute: Labyrinthine sedatives (Prochlorperazine). Chronic: Salt restriction, diuretics, and Betahistine.
- **Otosclerosis:**
    - **Patho:** Replacement of normal bone by spongy bone around the Stapes footplate.
    - **Signs: Schwartz Sign** (Flamingo pink flush on TM). PTA shows **Schwartz Sign** (dip at 2000 Hz in bone conduction).
    - **TX: Stapedectomy** with Teflon piston prosthesis.
- **Acoustic Neuroma:**
    - **Trigger:** Patient with unilateral tinnitus and progressive SNHL.
    - **INV: MRI with Gadolinium** (Gold Standard).

5. NOSE, SINUSES, & EPISTAXIS

- **Epistaxis:**
    - **Anterior:** Most common site is **Little's Area** (Kiesselbach's Plexus). TX: Pressure (Trotter's method) $\rightarrow$ Cautery $\rightarrow$ Anterior Nasal Packing.
    - **Posterior:** Often hypertensive elderly. Site: Sphenopalatine artery. TX: **Posterior Nasal Packing** (requires admission due to risk of hypoxia).
- **Rhinitis:**
    - **Allergic:** Triad of paroxysmal sneezing, nasal obstruction, and watery rhinorrhea. Look for **Pale/Bluish turbinates** and **nasal crease**. TX: Intranasal Steroids (Fluticasone) are first-line.

    - **Atrophic (Ozaena):** Foul smell (Ozaena), green crusts, and roominess in the nose. TX: Kemar's solution (Liquid paraffin + Menthol) or Young's surgery (closing the nostrils).
- **Sinusitis:**
    - **Maxillary Sinus:** Most commonly involved. Pain increases on bending forward.
    - **Ethmoid Sinus:** Can cause orbital cellulitis (emergency).
    - **TX:** Antibiotics and steam inhalation. If chronic: **FESS (Functional Endoscopic Sinus Surgery)**.

6. PHARYNX & LARYNX

- **Tonsillitis & Complications:**
    - **Quinsy (Peritonsillar Abscess):** Fever, **Trismus** (inability to open mouth), and **Uvula deviated to the opposite side**.
    - **TX:** Incision and Drainage (I&D) at the point of maximum bulge + Antibiotics.
- **Ludwig's Angina:**
    - **Patho:** Cellulitis of submandibular and sublingual spaces (usually from an infected lower molar).
    - **Trigger: Woody/Brawny swelling** of the neck and elevation of the tongue.
    - **TX:** Maintain airway (Intubation or Tracheostomy if needed) + IV Antibiotics + Surgical decompression.
- **Vocal Cord Nodules:**
    - **Trigger:** "Singer's Nodules." Bilateral, symmetrical nodules at the junction of anterior 1/3 and posterior 2/3 of vocal cords.
    - **TX:** Voice rest and speech therapy.

1. EMBRYOLOGY & FETAL CIRCULATION (DETAILED)

- **Fetal Circulation Shunts:**
  - **Ductus Venosus:** Connects the umbilical vein to the IVC, allowing oxygenated blood to bypass the liver.
  - **Foramen Ovale:** An opening in the atrial septum. Blood flows from Right to Left Atrium because fetal **Pulmonary Vascular Resistance (PVR)** is high.
  - **Ductus Arteriosus:** Shunts blood from the Pulmonary Artery to the Aorta.
- **Post-Natal Changes:** At birth, the baby breathes → PVR drops → Left Atrial pressure exceeds Right Atrial pressure → **Foramen Ovale closes** (becomes Fossa Ovalis).
- **Ligaments:**
  - Umbilical vein → **Ligamentum teres**.
  - Ductus arteriosus → **Ligamentum arteriosum**.
  - Ductus venosus → **Ligamentum venosum**

- **Heart Tube Folding:** Occurs in week 4; defects here lead to **Dextrocardia** (associated with Kartagener Syndrome).
- **Septation of the Atria:**
  - **Foramen Primum** narrows as **Septum Primum** grows.
  - **Septum Secundum** grows, leaving a hole called the **Foramen Ovale**.
- **Septation of the Ventricles:**
  - **Muscular VSD:** Most common congenital cardiac anomaly.
  - **Membranous VSD:** Most common site for VSD.
- **Aortic Arch Derivatives:**
  - **1st Arch:** Maxillary artery.
  - **3rd Arch:** Common Carotid and proximal Internal Carotid.
  - **4th Arch:** Left is Aortic Arch; Right is proximal Right Subclavian.
  - **6th Arch:** Proximal Pulmonary arteries and **Ductus Arteriosus**.

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2. PHYSIOLOGY: HEMODYNAMICS & CYCLE

- **Pressure-Volume Loops:**
  - **Increased Preload:** Increases Stroke Volume (loop widens to the right).
  - **Increased Afterload:** Increases Aortic pressure, decreases Stroke Volume (loop gets taller and narrower).
  - **Increased Contractility:** Increases Stroke Volume and Ejection Fraction (loop widens to the left).
- **Jugular Venous Pulse (JVP):**
  - **a wave:** Atrial contraction. Absent in **Atrial Fibrillation**.
  - **v wave:** Venous filling against closed tricuspid valve. Giant v waves in **Tricuspid Regurgitation**.
  - **y descent:** Passive emptying of RA into RV. Prominent in **Constrictive Pericarditis**.

3. HEART SOUNDS & MURMURS

- **S3 (Ventricular Gallop):** Early diastole. Normal in kids/athletes; in adults, it indicates **Volume Overload** (Heart Failure, Mitral Regurgitation).
- **S4 (Atrial Gallop):** Late diastole. Always abnormal; indicates **Pressure Overload** (Hypertrophic Cardiomyopathy, HTN).
- **Murmurs:**
  - **Mitral Stenosis:** Opening snap followed by a mid-diastolic rumble.
  - **Aortic Stenosis:** Crescendo-decrescendo systolic murmur. Radiates to **carotids**.
  - **Aortic Regurgitation:** Early diastolic decrescendo murmur. Associated with **Water-hammer pulse**.
  - **Mitral Regurgitation:** Holosystolic murmur at the apex. Radiates to **axilla**.

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4. RHEUMATIC FEVER & ENDOCARDITIS

- **Rheumatic Heart Disease:**
  - **Acute:** Mitral **Regurgitation**.
  - **Chronic:** Mitral **Stenosis** (fish-mouth appearance).
  - **Pathology: Aschoff bodies** (granulomas with giant cells) and **Anitschkow cells** (caterpillar nucleus).
- **Libman-Sacks Endocarditis:** Small, sterile vegetations on *both* sides of the valve. Associated with **SLE**.

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5. CONGENITAL HEART DEFECTS (SPECIFICS)

- **Tetralogy of Fallot (TOF):**
  - **Mechanism:** Anterosuperior displacement of the infundibular septum.
  - **Tet Spells:** Children squat to increase **Systemic Vascular Resistance (SVR)**, which reverses the right-to-left shunt and improves oxygenation.
- **Patent Ductus Arteriosus (PDA):**
  - **Clinical:** Wide pulse pressure and "bounding" pulses.
  - **Management:** Keep it open with **Prostaglandins** (if other defects exist) or close it with **Indomethacin** (NSAID).
- **Coarctation of the Aorta:**
  - **Trigger:** Hypertension in the arms but weak/delayed pulses in the legs (**Radio-femoral delay**).
  - **Imaging:** "Rib notching" on X-ray due to collateral circulation. Associated with **Turner Syndrome**.

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6. INFECTIVE ENDOCARDITIS (SCENARIOS)

- **IV Drug Users:** Most common organism is **S. aureus**; most common valve is the **Tricuspid** (leads to septic pulmonary emboli).
- **Prosthetic Valves:**
  - < 60 days post-op: **S. epidermidis**.
  - 60 days post-op: **S. aureus**.
- **Dental Procedures: Viridans streptococci** (S. sanguinis).
- **Colorectal Cancer:** If the organism is **S. bovis** (S. gallolyticus), you must perform a **Colonoscopy**.
- **Culture Negative IE:** Often caused by the **HACEK** group (*Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella, Kingella*).

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7. CARDIOMYOPATHY TYPES

- **Dilated:** Most common (90%). Heart looks like a "balloon." Causes: **Alcohol**, Beriberi, Coxsackie B virus, Doxorubicin. Leads to Systolic dysfunction (S3 gallop).
- **Hypertrophic (HOCM):** Genetic (Sarcomere proteins). Septum is too thick.
  - **Clinical:** Sudden cardiac death in a young athlete.
  - **Murmur:** Increases with Valsalva/Standing (decreased preload).
- **Restrictive:** Heart is "stiff." Causes: **Amyloidosis**, Sarcoidosis, Hemochromatosis. Leads to Diastolic dysfunction.

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8. VASCULITIS (THE PATHOLOGY)

- **Polyarteritis Nodosa (PAN):** Necrotizing vasculitis of medium-sized vessels. Associated with **Hepatitis B**. Affects kidneys and GI but **spares the lungs**.
- **Kawasaki Disease (Mucocutaneous Lymph Node Syndrome):**
  - **CRASH and Burn: C**onjunctivitis, **R**ash, **A**denopathy (cervical), **S**trawberry tongue, **H**and/foot edema, and **Burn** (High fever).
  - **TX:** IVIG and **High-dose Aspirin** (one of the few times Aspirin is given to children).
- **Buerger Disease:** Segmental thrombosing vasculitis. Pathognomonic finding: **Instep claudication** and Raynaud phenomenon.

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9. ISCHEMIA & ECG LOCALIZATION

- **Stable Angina:** Chest pain < 20 mins; ST depression on ECG (subendocardial ischemia).
- **Myocardial Infarction:** Chest pain > 30 mins; Troponin levels rise at 4–6 hours and peak at 24 hours.

- **Localization (The "I-L-A-S" Mnemonic):**
    - **I**nferior: II, III, aVF (**RCA**)
    - **L**ateral: I, aVL, V5, V6 (**LCX**)
    - **A**nterior: V3, V4 (**LAD**)
    - **S**eptal: V1, V2 (**LAD**)

10. HYPERTENSION & VASCULAR PATHOLOGY

- **Hypertension Categories:**
    - **Urgency:** $BP > 180/120$ without end-organ damage.
    - **Emergency:** $BP > 180/120$ **WITH** end-organ damage (encephalopathy, stroke, MI). TX: IV Nitroprusside or Labetalol.
- **Aortic Aneurysms:**
    - **Abdominal (AAA):** Usually infrarenal. Associated with **Atherosclerosis**.
    - **Thoracic (TAA):** Associated with **Cystic Medial Necrosis** (Marfan Syndrome) or Tertiary Syphilis (obliterative endarteritis of vasa vasorum).

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11. PHARMACOLOGY: ANTI-HYPERTENSIVES & ANTI-LIPIDEMICS

- **Hydralazine:** Increases cGMP → smooth muscle relaxation. Used in **Pregnancy-induced HTN** (along with Methyldopa, Labetalol, and Nifedipine).
- **Lipid-Lowering Agents:**
    - **Statins:** $\downarrow LDL$ (most effective). Inhibits HMG-CoA Reductase.
    - **Fibrates:** $\downarrow Triglycerides$ (most effective). Upregulate LPL.
    - **Bile Acid Sequestrants (Cholestyramine):** Prevents reabsorption of bile acids.
- **Class 1A Anti-arrhythmics (Procainamide, Quinidine):** Can cause **Cinchonism** (tinnitus/headache) or Drug-induced SLE.
- **Class 1B (Lidocaine, Mexiletine):** Best for post-MI arrhythmias.

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12. CARDIAC LOCALIZATION (FIRST AID CHART)

- **V1–V2:** Septal (LAD)
- **V3–V4:** Anterior (LAD)
- **V5–V6:** Apical/Low Lateral (LAD or LCX)
- **I, aVL:** High Lateral (LCX)
- **II, III, aVF:** Inferior (RCA)

1. EMBRYOLOGY & STRUCTURAL DEFECTS

Division & Blood Supply

- **Foregut:** Esophagus to upper duodenum — supplied by **Celiac Artery**.
- **Midgut:** Lower duodenum to proximal 2/3 transverse colon — supplied by **SMA**.
- **Hindgut:** Distal 1/3 transverse colon to upper anal canal — supplied by **IMA**.

Ventral Wall Defects

- **Gastroschisis:** Bowel protrudes through abdominal wall defect; **not covered** by peritoneum. Usually right of umbilicus.
- **Omphalocele:** Herniation into umbilical cord; **covered by peritoneum** and often associated with chromosomal anomalies.

Tracheoesophageal Fistula (TEF)

- Most common: **Type C** (Esophageal atresia with distal fistula).
- Neonate presents with **drooling, choking, cyanosis**, and inability to feed.
- Polyhydramnios is common during pregnancy.

Hypertrophic Pyloric Stenosis

- 2–6 week old male infant with **non-bilious projectile vomiting** and palpable **olive-shaped mass**.
- Caused by hypertrophy of pyloric muscle.
- Labs: **Hypokalemic hypochloremic metabolic alkalosis**.

Hirschsprung Disease

- Failure of **neural crest cell migration** → absent **Auerbach & Meissner plexuses**.
- Neonate fails to pass meconium within 48 hrs.
- Associated with **Down syndrome**.
- Diagnosis: Rectal suction biopsy.

Midgut Volvulus

- Twisting of bowel around the **SMA** due to malrotation.
- Causes bilious vomiting and intestinal ischemia.
- "**Corkscrew sign**" on imaging. Surgical emergency.

Meckel Diverticulum

- Persistent **vitelline duct**.
- **Rule of 2s:**

    - 2 inches long
    - 2 feet from ileocecal valve
    - 2% population
    - 2 types ectopic tissue (gastric/pancreatic)
- Can cause painless rectal bleeding.

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2. ESOPHAGEAL & GASTRIC PATHOLOGY

Achalasia

- Loss of myenteric plexus inhibitory neurons (**NO & VIP**).
- Increased LES tone with difficulty swallowing solids and liquids.
- "**Bird's beak**" appearance on barium swallow.
- Secondary cause: **Chagas disease**.

Tears & Ruptures

- **Mallory-Weiss:** Mucosal tear at GE junction after vomiting → painful hematemesis.
- **Boerhaave Syndrome:** Transmural esophageal rupture → pneumomediastinum and subcutaneous emphysema.

GERD & Barrett Esophagus

- Chronic acid reflux causing metaplasia from **stratified squamous → non-ciliated columnar epithelium with goblet cells**.
- Increases risk of **esophageal adenocarcinoma**.

Plummer-Vinson Syndrome

- Triad: **Dysphagia + Iron deficiency anemia + Esophageal webs (DIE)**.
- Risk factor for squamous cell carcinoma.

Gastritis

Acute

- **Cushing ulcer:** Due to increased ICP → vagal stimulation → increased acid secretion.
- **Curling ulcer:** Seen in severe burns due to stress ischemia.

Chronic

- **Type A:** Autoimmune destruction of parietal cells → pernicious anemia.
- **Type B:** Due to **H. pylori**, usually in antrum.

Peptic Ulcer Disease (PUD)

- **Duodenal ulcer:** Pain decreases with meals; associated with H. pylori.
- **Gastric ulcer:** Pain worsens with meals.
- Duodenal ulcers may perforate anteriorly or bleed posteriorly from the **gastroduodenal artery**.

Gastric Cancer

- **Intestinal type:** Associated with H. pylori, smoking, nitrosamines.
- **Diffuse type:** Signet ring cells and **linitis plastica**.
- Virchow node enlargement may occur.

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3. LIVER, BILIARY & PANCREAS

Jaundice Types

- **Pre-hepatic:** Hemolysis → ↑ unconjugated bilirubin.
- **Hepatic:** Liver dysfunction → mixed bilirubin elevation.
- **Post-hepatic:** Obstruction → ↑ conjugated bilirubin, pale stools, dark urine.

Neonatal Jaundice

- **Biliary atresia:** Persistent jaundice with clay-colored stools.
- Managed with **Kasai procedure**.

Metabolic Disorders

Wilson Disease

- **ATP7B mutation** causing copper accumulation.
- Features: Kayser-Fleischer rings, liver disease, neurologic symptoms.
- Low ceruloplasmin.

Hemochromatosis

- **HFE mutation** causing iron overload.
- Causes cirrhosis, cardiomyopathy, diabetes (“bronze diabetes”).

Biliary Diseases

Primary Biliary Cholangitis (PBC)

- Autoimmune destruction of intrahepatic ducts.
- Positive **AMA**.

Primary Sclerosing Cholangitis (PSC)

- Fibrosis of intra/extrahepatic ducts.
- "**Beading**" on ERCP.
- Associated with **Ulcerative Colitis** and p-ANCA.

Acute Cholangitis

- **Charcot triad:** Fever + jaundice + RUQ pain.
- Severe cases may develop hypotension and confusion (**Reynolds pentad**).

Pancreatitis

Acute

- Autodigestion by pancreatic enzymes, especially trypsin.
- Causes: Gallstones and alcohol ("**I GET SMASHED**").
- Elevated serum lipase is most specific.

Chronic

- Pancreatic calcifications and fibrosis.
- Causes steatorrhea, diabetes, and fat-soluble vitamin deficiency.

Pancreatic Cancer

- Usually adenocarcinoma of pancreatic head.
- Presents with painless jaundice and palpable gallbladder (**Courvoisier sign**).
- Smoking is a major risk factor.

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4. SMALL & LARGE INTESTINE

IBD Comparison

Crohn Disease

- Transmural inflammation with **skip lesions**.
- Cobblestone mucosa and non-caseating granulomas.
- "String sign" on imaging.
- Fistula formation is common.

Ulcerative Colitis

- Limited to mucosa/submucosa.
- Continuous involvement starting from rectum.
- Crypt abscesses and “lead-pipe” colon.
- Increased risk of toxic megacolon and colon cancer.

Malabsorption Disorders

Celiac Disease

- Autoimmune reaction to gluten.
- Positive **Anti-TTG** antibodies.
- Associated with dermatitis herpetiformis.

Lactose Intolerance

- Lactase deficiency causing osmotic diarrhea and bloating.
- Stool pH decreases.

Whipple Disease

- Caused by **Tropheryma whipplei**.
- PAS-positive macrophages in intestinal lamina propria.

Intussusception

- Telescoping of bowel into distal segment.
- Child presents with colicky pain, “currant jelly” stool, and sausage-shaped mass.
- Often associated with **Meckel diverticulum**.

Colon Cancer

- **Right-sided:** Iron deficiency anemia and occult bleeding.
- **Left-sided:** Obstruction and altered bowel habits.

Polyps

- **Villous adenomas** have highest malignant potential.
- Familial adenomatous polyposis (FAP) is due to APC mutation.

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5. REGULATORY SUBSTANCES & PHARMACOLOGY

Hormones

- **Gastrin:** ↑ gastric acid secretion and mucosal growth.
- **CCK:** ↑ pancreatic enzyme secretion and gallbladder contraction.
- **Secretin:** ↑ bicarbonate secretion from pancreas.
- **Somatostatin:** Inhibits most GI hormones.
- **VIP:** Relaxes smooth muscle and increases intestinal secretion.

Drugs

PPIs (Omeprazole)

- Irreversibly inhibit **H^+/K^+ ATPase**.
- Used for GERD and peptic ulcer disease.

H2 Blockers (Cimetidine)

- Reversibly block H2 receptors.
- Cimetidine inhibits CYP450 and may cause gynecomastia.

Misoprostol

- PGE1 analog protecting gastric mucosa.
- Prevents NSAID-induced ulcers.
- Contraindicated in pregnancy.

Lactulose

- Osmotic laxative used in hepatic encephalopathy.
- Converts NH_3 to NH_4^+ in gut.

Ondansetron

- 5-HT3 antagonist used for severe nausea/vomiting.
- Common in chemotherapy-induced vomiting.

EMBRYOLOGY & DEVELOPMENTAL ERRORS

- **Embryology:** Kidney develops from three stages: **Pronephros** (regresses), **Mesonephros** (functions briefly), and **Metanephros** (becomes the permanent kidney).
- **Renal Agenesis:** Failure of the ureteric bud to induce the metanephric mesenchyme. Bilateral leads to **Potter Sequence** (oligohydramnios, lung hypoplasia, flat face).
- **Horseshoe Kidney:** Inferior poles of both kidneys fuse. They get stuck under the **Inferior Mesenteric Artery (IMA)** during ascent.
- **Ectopic Kidney:** Kidney fails to ascend; usually stays in the pelvis.

RENAL PHYSIOLOGY & FILTRATION

- **Glomerular Filtration Barrier:** Composed of Fenestrated endothelium, Basement membrane (negative charge), and Podocyte foot processes.
  - **Trigger:** Loss of negative charge leads to **Albuminuria**.
- **GFR (Glomerular Filtration Rate):** Best index of kidney function. Inulin is the gold standard for measurement, but **Creatinine** is used clinically.
- **ADH:** Acts on **V2 receptors** in the collecting duct to insert **Aquaporin-2** channels (reabsorbs water).
- **Angiotensin II:** Potent vasoconstrictor; preferentially constricts the **Efferent arteriole** to maintain GFR when renal blood flow is low

TUBULAR SYNDROMES (THE "DIURETIC MIMICS")

- **Bartter Syndrome:**
  - **Mechanism:** Defect in the **NKCC2** transporter in the Thick Ascending Limb of the Loop of Henle.
  - **NRE Trigger:** This is a "genetic Loop diuretic." It presents in infancy/childhood with polyuria and polydipsia.
  - **Labs:** Hypokalemia, Metabolic Alkalosis, and **Hypercalciuria** (High urine calcium).
- **Gitelman Syndrome:**
  - **Mechanism:** Defect in the **NCC** transporter in the Distal Convoluted Tubule.
  - **NRE Trigger:** This is a "genetic Thiazide diuretic." It usually presents later in life (teens/adults) with muscle cramps.
  - **Labs:** Hypokalemia, Metabolic Alkalosis, and **Hypocalciuria** (Low urine calcium) + Hypomagnesemia.
- **Liddle Syndrome:**
  - **Mechanism:** Gain-of-function mutation in the **ENaC** channels in the Collecting Duct.
  - **NRE Trigger:** It looks exactly like Hyperaldosteronism (HTN + Low K+) but with a twist: **Aldosterone and Renin are both LOW**.
  - **TX:** Amiloride (blocks ENaC). Note: Spironolactone does *not* work here.

RENAL TUBULAR ACIDOSIS (RTA)

- **Type 1 RTA (Distal):**
  - **Mechanism:** Alpha-intercalated cells cannot secrete H^{+} into the urine.
  - **Clinical Clue: Urine pH is always > 5.5**. Associated with hypokalemia and **Calcium Phosphate kidney stones** (due to high urine pH).
- **Type 2 RTA (Proximal):**
  - **Mechanism:** Proximal tubule cannot reabsorb HCO_{3}^{-}.
  - **Clinical Clue:** Associated with **Fanconi Syndrome** (loss of glucose, amino acids, and phosphate in urine). Initially, urine pH is high, but later it can drop below 5.5 as the body tries to compensate.
- **Type 4 RTA (Hyperkalemic):**
  - **Mechanism:** Aldosterone deficiency or resistance (often due to Diabetes or NSAIDs).
  - **Clinical Clue:** The only RTA with **Hyperkalemia** (High K^{+}). It is common in patients with Diabetic Nephropathy.

NEPHROTIC SYNDROME (DETAILED CAUSES)

- **Minimal Change Disease (MCD):**
  - **Trigger:** Most common cause in children. Often follows a respiratory infection or immunization.
  - **Pathology:** Effacement of podocyte foot processes on Electron Microscopy.
  - **TX:** Excellent response to **Steroids**.
- **Membranous Nephropathy:**
  - **Trigger:** Most common cause in adults. Associated with Hepatitis B, Hepatitis C, NSAIDs, and Solid Tumors.
  - **Pathology: "Spike and Dome"** appearance of the basement membrane on Silver stain.
- **Focal Segmental Glomerulosclerosis (FSGS):**
  - **Trigger:** Common in patients with HIV, Heroin use, or Obesity.
  - **Pathology:** Only parts (focal/segmental) of the glomeruli show scarring (sclerosis).
- **Renal Amyloidosis:**
  - **Trigger:** Associated with chronic inflammatory states (e.g., Tuberculosis, Rheumatoid Arthritis).
  - **Pathology: Congo Red stain** shows **Apple-green birefringence** under polarized light.

NEPHRITIC SYNDROME (GLOMERULONEPHRITIS)

- **Post-Streptococcal Glomerulonephritis (PSGN):**
  - **Trigger:** Occurs 2–3 weeks after a Strep throat or skin infection.
  - **Labs:** Low C3 levels; positive ASO titer.
  - **Pathology: "Lumpy-bumpy"** deposits on IMF; subepithelial humps on EM.
- **Goodpasture Syndrome:**

    - **Mechanism:** Antibodies against the Glomerular Basement Membrane (GBM).
    - **Trigger:** Hematuria + Hemoptysis (Lung involvement).
    - **Pathology: Linear** Immunofluorescence.
- **Alport Syndrome:**
    - **Mechanism:** Defect in **Type IV Collagen**.
    - **Trigger:** Family history of **Deafness, Eye problems, and Renal failure**.
    - **Pathology: "Basket-weave"** appearance on EM.

RENAL FAILURE & KIDNEY STONES

- **Acute Kidney Injury (AKI) Stages:**
    - **Pre-renal:** Due to dehydration/bleeding. $BUN:Creatinine$ ratio **> 20:1**. Fractional Excretion of Sodium (FeNa) **< 1%**.
    - **Intrinsic (ATN):** Due to toxins or ischemia. $BUN:Cr$ ratio **< 15:1**. FeNa **> 2%**. Look for **"Muddy brown casts."**
- **Kidney Stones (High Yield Management):**
    - **Calcium Oxalate:** Most common. Shaped like **envelopes**. Caused by ethylene glycol (antifreeze) ingestion or Crohn's disease.
    - **Struvite (Infection):** Caused by **Proteus** (Urease+ bacteria). Forms large **Staghorn Calculi**.
    - **Uric Acid:** Only stone that is **Radiolucent** (invisible on X-ray).
    - **TX:**
        - < 5mm: Hydration and Alpha-blockers (Tamsulosin) to pass it.
        - 5mm–10mm: Shockwave Lithotripsy (ESWL).
            - 10mm or Staghorn: PCNL (Percutaneous Nephrolithotomy).

RENAL TUMORS & PHARMACOLOGY

- **Renal Cell Carcinoma (RCC):**
    - **Trigger:** 60-year-old male, smoker, with hematuria and a flank mass.
    - **Patho:** Most common type is **Clear Cell Carcinoma** (arising from Proximal Tubule cells).
    - **Key Fact:** Can cause a **left-sided varicocele** because the left gonadal vein drains into the left renal vein (which may be blocked by the tumor).
- **Diuretics Recap:**
    - **Acetazolamide:** Works on Proximal Tubule. Used for Glaucoma and Altitude Sickness.
    - **Loop Diuretics:** Work on TAL. Can cause **Ototoxicity** (deafness) and Sulfa allergies.
    - **Thiazides:** Work on DCT. Cause **HyperGLUC** (Hyperglycemia, Hyperlipidemia, HyperUricemia, HyperCalcemia).

1. AUTOIMMUNE & INFLAMMATORY ARTHRITIS

- **Rheumatoid Arthritis (RA):**
  - **Mechanism:** Type III hypersensitivity; autoimmune destruction of synovial joints.
  - **Clinical:** Bilateral, symmetrical small joint involvement (PIP, MCP). **Morning stiffness > 1 hour** that improves with use.
  - **Signs:** Ulnar deviation, Boutonniere deformity, Swan-neck deformity.
  - **Antibodies: Anti-CCP** (more specific) and Rheumatoid Factor (RF).
  - **Imaging:** Joint space narrowing and marginal erosions.

- **Osteoarthritis (OA):**
  - **Mechanism:** "Wear and tear" of articular cartilage; non-inflammatory.
  - **Clinical:** Unilateral or bilateral large joints (knee, hip). **Pain worsens with use** and improves with rest.
  - **Signs: Heberden nodes** (DIP joints) and **Bouchard nodes** (PIP joints).
  - **Imaging:** Osteophytes (bone spurs) and subchondral sclerosis.
- **Ankylosing Spondylitis:**
  - **Mechanism:** Seronegative spondyloarthropathy; HLA-B27 associated.
  - **Clinical:** Young male with chronic low back pain and stiffness. Improves with exercise.
  - **Imaging: "Bamboo Spine"** (fusion of vertebrae).
  - **Complication:** Uveitis (eye pain/redness).
- **Reiter Syndrome (Reactive Arthritis):**
  - **Trigger:** Follows a GI (*Salmonella/Shigella*) or GU (*Chlamydia*) infection.
  - **Triad: "Can’t see, can’t pee, can’t climb a tree"** (Uveitis, Urethritis, Arthritis).

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2. SYSTEMIC CONNECTIVE TISSUE DISORDERS

- **Systemic Lupus Erythematosus (SLE):**
  - **Triggers:** Malar "butterfly" rash, photosensitivity, and joint pain in a young female.
  - **Antibodies: ANA** (best initial/screening); **Anti-dsDNA** and **Anti-Smith** (highly specific).
  - **Complication:** Lupus Nephritis (requires biopsy).

- **Systemic Sclerosis (Scleroderma):**
  - **Diffuse Type:** Widespread skin involvement + early visceral involvement (lungs/kidneys). Antibody: **Anti-Scl-70** (Anti-topoisomerase I).
  - **Limited Type (CREST Syndrome): C**alcinosis, **R**aynaud’s, **E**sophageal dysmotility, **S**clerodactyly, **T**elangiectasia. Antibody: **Anti-centromere**.
- **Dermatomyositis & Polymyositis:**
  - **Polymyositis:** Symmetrical **proximal** muscle weakness (difficulty climbing stairs).

- **Dermatomyositis:** Same weakness + skin findings: **Gottron papules** (knuckles) and **Heliotrope rash** (eyelids).
- **Antibody: Anti-Jo-1**.

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3. CRYSTAL ARTHROPATHIES

- **Gout:**
  - **Patho:** Monosodium urate crystals. Triggered by alcohol or red meat.
  - **Joint:** Most common in the Great Toe (**Podagra**).
  - **Synovial Fluid: Needle-shaped** crystals with **negative birefringence** (yellow when parallel).
- **Pseudogout:**
  - **Patho:** Calcium pyrophosphate crystals.
  - **Synovial Fluid: Rhomboid-shaped** crystals with **positive birefringence** (blue when parallel).
  - **Imaging:** Chondrocalcinosis (calcification of cartilage).

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4. MSK EMERGENCIES & NERVE INJURIES

- **Septic Arthritis:**
  - **Trigger:** Acute onset of a single red, hot, swollen joint with fever.
  - **Management: Emergency joint aspiration** (Arthrocentesis). WBC count > 50,000.
  - **TX:** IV antibiotics (Ceftriaxone/Vancomycin).
- **Compartment Syndrome:**
  - **Patho:** Increased pressure within a muscle compartment (usually after a fracture).
  - **Signs (The 6 Ps): Pain out of proportion to exam** (earliest sign), Paresthesia, Pallor, Paralysis, Pulselessness (late), Poikilothermia.
  - **TX: Emergency Fasciotomy**.
- **Nerve Injuries due to Fractures:**
  - **Humerus Mid-shaft: Radial Nerve** (Wrist drop).
  - **Surgical Neck of Humerus: Axillary Nerve** (Deltoid paralysis).
  - **Supracondylar Humerus: Median Nerve** (Hand of Benediction).

5. BONE TUMORS

- **Osteosarcoma:** Most common primary bone tumor. Young patients. **Codman triangle** or "Sunburst" pattern on X-ray.
- **Ewing Sarcoma:** Occurs in the diaphysis. **"Onion-skin"** periosteal reaction.
- **Giant Cell Tumor:** Occurs in the epiphysis. **"Soap bubble"** appearance.

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6. NEUROMUSCULAR & SPINE

- **Myasthenia Gravis vs. Lambert-Eaton:**
  - **MG:** Antibodies vs. ACh receptors. Weakness **worsens** with use. Associated with Thymoma.
  - **LEMS:** Antibodies vs. Voltage-gated Ca2+ channels. Weakness **improves** with use. Associated with **Small Cell Lung Cancer**.
- **Herniated Disc:** S1/L5 most common. Positive **Straight Leg Raise** test.
- **Spinal Stenosis:** Back pain relieved by leaning forward ("Shopping cart sign").

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7. PHARMACOLOGY

- **NSAIDs:** First-line for OA and acute Gout. Inhibit COX enzymes.
- **Methotrexate:** First-line DMARD for Rheumatoid Arthritis. Must monitor LFTs and give **Folic Acid**.
- **Colchicine:** Used for acute Gout flares if NSAIDs are contraindicated.
- **Allopurinol:** Chronic Gout management; inhibits Xanthine Oxidase. **Never start during an acute attack.**
- **Bisphosphonates:** (e.g., Alendronate) for Osteoporosis. Patient must sit upright for 30 mins to avoid esophagitis.

1. ANATOMY & LOCALIZATION

CRANIAL NERVE LESIONS (LOCALIZATION)

- **CN III (Oculomotor):**
  - **Palsy with Pupil Sparing:** Usually **Diabetes** (ischemic). The pupillary fibers are on the outside of the nerve, so they survive ischemia initially.
  - **Palsy with Dilated Pupil:** Usually **Compression** (e.g., Posterior Communicating Artery aneurysm). This is a surgical emergency.
- **CN VII (Facial Nerve):**
  - **Bell's Palsy (LMN):** Damage to the nerve itself. The patient **cannot** wrinkle their forehead, close their eye tightly, or smile on the affected side.
  - **Stroke (UMN):** Damage to the motor cortex. The patient **can** wrinkle their forehead (because the forehead receives bilateral innervation from the brain), but the lower face is paralyzed.
- **CN V (Trigeminal): Trigeminal Neuralgia.** Shooting, "electric-shock" pain in the face triggered by chewing or touch. TX: **Carbamazepine**.

FLOW OF CSF & HYDROCEPHALUS

- **Non-Communicating (Obstructive):** Blockage *inside* the ventricular system (e.g., Aqueductal stenosis).
- **Communicating:** Problem with *absorption* at the arachnoid granulations (e.g., after Meningitis or SAH).
- **Hydrocephalus Ex Vacuo:** Brain atrophy (like in Alzheimer's) makes the ventricles *look* large, but the pressure is normal.

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2. CEREBROVASCULAR ACCIDENTS (STROKE & HEMORRHAGE)

INTRACRANIAL HEMORRHAGES (THE RADIOLOGY BIT)

- **Epidural Hematoma (EDH):** Middle Meningeal Artery. Look for a **Lucid Interval**. On CT, it is a **Lens-shaped (Biconvex)** hyperdensity. It cannot cross suture lines because the dura is firmly attached there.
- **Subdural Hematoma (SDH):** Bridging Veins. Common in the elderly after a minor fall. On CT, it is **Crescent-shaped**. It *can* cross suture lines but is limited by dural reflections (like the falx cerebri).
- **Subarachnoid Hemorrhage (SAH):** Ruptured Berry Aneurysm.
  - **Clinical:** "Worst headache of life" + Nuchal rigidity.
  - **Complication: Vasospasm** (occurs 3–10 days later). TX: **Nimodipine** (Calcium channel blocker) to prevent this.

GUILLAIN-BARRÉ SYNDROME (GBS)

- **Mechanism:** Molecular mimicry. Antibodies against *C. jejuni* cross-react with peripheral nerve myelin.
- **Clinical:** Ascending paralysis + **Areflexia** (absent jerks).
- **Emergency:** Monitor **Vital Capacity**. If it drops, the patient needs intubation (respiratory failure).
- **TX:** Plasmapheresis or IVIG. **Steroids are contraindicated.**

MULTIPLE SCLEROSIS (MS)

- **Triggers: Internuclear Ophthalmoplegia (INO)**—when looking to the side, one eye stays midline while the other has nystagmus. Due to a lesion in the **MLF (Medial Longitudinal Fasciculus)**.
- **Lhermitte Sign:** Electric shock sensation down the spine when flexing the neck.
- **TX:** Acute: IV Methylprednisolone (Steroids). Long-term: Interferon-beta.

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4. MOVEMENT & DEGENERATIVE DISORDERS

PARKINSON'S DISEASE

- **Pathophysiology:** Loss of pigmented neurons in the **Substantia Nigra pars compacta**.
- **Histology: Lewy Bodies** (alpha-synuclein).
- **Management:** Levodopa/Carbidopa is the gold standard. Side effect: **Dyskinesia** (involuntary movements) after long-term use.

WILSON'S DISEASE

- **Pathophysiology:** Mutation in the **ATP7B** gene on Chromosome 13. Copper builds up in the Liver, Basal Ganglia, and Cornea.
- **Clinical:** Parkinsonism in a young person + Liver cirrhosis + **Kayser-Fleischer rings** (seen on Slit-lamp exam).
- **TX:** Penicillamine (chelating agent) or Zinc.

MYASTENIA GRAVIS

- **Diagnosis: Tensilon (Edrophonium) Test**—briefly improves muscle strength.
- **Crisis:** Myasthenic Crisis (not enough meds) vs. Cholinergic Crisis (too much meds). Both cause weakness.
- **Associated Condition:** 75% have **Thymic hyperplasia**; 15% have **Thymoma**. Chest CT is mandatory.

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5. HEADACHES & SEIZURES

HEADACHES

- **Migraine:** Associated with an **Aura** (visual flashes). Prophylaxis: Propranolol, Amitriptyline, or Topiramate.
- **Cluster:** 100% Oxygen is the acute treatment. It is the only headache more common in **males**.
- **Tension:** Stress-related. Most common type.

SEIZURES (FITS)

- **Todd's Paralysis:** Temporary focal weakness (paralysis) following a seizure.
- **Post-ictal state:** Confusion and drowsiness after a tonic-clonic seizure (helps distinguish from syncope/fainting).
- **Ethosuximide:** Specifically for **Absence Seizures**. It blocks T-type Calcium channels in the thalamus.

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6. SLEEP PHYSIOLOGY

- **Stage N3 (Deep Sleep):** Delta waves. This is when **Sleepwalking (Somnambulism)**, Bedwetting (Enuresis), and Night terrors occur.
- **REM Sleep:** Beta waves. Rapid eye movements, dreaming, and **Loss of muscle tone**.
    - **Narcolepsy:** Direct transition from being awake to REM sleep. Clinical: Cataplexy (falling down with emotion), sleep paralysis, and hypnagogic hallucinations.

1. CSF FLOW & HYDROCEPHALUS

- **Pathway:** Choroid Plexus → Foramina of Monro → 3rd Ventricle → **Aqueduct of Sylvius** (narrowest part) → 4th Ventricle → Foramina of Luschka/Magendie → Subarachnoid Space.
- **Hydrocephalus Types:**
    - **Non-communicating (Obstructive):** Structural block (e.g., Aqueductal stenosis or tumors).
    - **Communicating:** Impaired absorption at **Arachnoid Granulations** (post-meningitis/SAH).
    - **Normal Pressure (NPH):** "Wet, Wacky, Wobbly" (Incontinence, Dementia, Ataxia). CT shows enlarged ventricles out of proportion to sulci.

2. CRANIAL NERVE "SPOTTERS"

- **CN III (Oculomotor):** "Down and Out" eye. If the **pupil is dilated**, it's compression (Aneurysm); if the **pupil is spared**, it's ischemia (Diabetes).
- **CN VII (Facial):**
    - **Bell's Palsy (LMN):** Can't wrinkle forehead + drooped mouth.

    - **Stroke (UMN): Forehead is spared** (can still wrinkle it).
- **CN V (Trigeminal):** Tic Douloureux (Trigeminal Neuralgia); stabbing pain. TX: **Carbamazepine**.

4. NEUROMUSCULAR & AUTOIMMUNE

- **Myasthenia Gravis:** Antibodies vs **ACh Receptors**. Fatigable ptosis/weakness. Associated with **Thymoma**. TX: **Pyridostigmine**.
- **Guillain-Barré (GBS): Ascending paralysis** + Areflexia. Post-*C. jejuni*. CSF: **Albuminocytologic dissociation** (High protein, normal cells). TX: IVIG/Plasmapheresis. **NO STEROIDS.**
- **Multiple Sclerosis: Optic neuritis** (painful vision loss) + INO. MRI: Periventricular plaques. CSF: **Oligoclonal bands**.

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5. HEADACHES & FITS

- **Migraine:** Unilateral, Aura, Photophobia. TX: Sumatriptan (Acute), Propranolol (Prophylaxis).
- **Cluster:** Unilateral periorbital pain + tearing. More common in **Males**. TX: **100% Oxygen**.
- **Tension:** "Tight band" around the head. Bilateral.
- **Absence Seizure:** Child staring into space. 3Hz spike-and-wave. TX: **Ethosuximide**.
- **Status Epilepticus:** Seizure >5 mins. TX: **IV Diazepam/Lorazepam** → Phenytoin.

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6. MOVEMENT & DEGENERATIVE

- **Parkinson's: TRAP** (Tremor, Rigidity, Akinesia, Postural instability). Substantia Nigra. TX: Levodopa.
- **Wilson’s:** Young age, Parkinsonism, Cirrhosis, **Kayser-Fleischer rings**. Low Ceruloplasmin.
- **Alzheimer's:** Most common dementia. Beta-amyloid plaques. TX: **Donepezil**.
- **Huntington's: CAG repeats**. Chorea + Dementia. Caudate nucleus atrophy.

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7. CIRCLE OF WILLIS & PHYSIOLOGY

- **Berry Aneurysm:** Most common at **Anterior Communicating Artery**.
- **Sleep Stages:**
    - **N3 (Deep):** Sleepwalking, Bedwetting, Night terrors.
    - **REM:** Dreams, Muscle atonia (paralysis), Beta waves.